PHILIPS
MINIWATT

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PHILIPS "Miniwatt" 1938

THE BRIDGE

TO BETTER RADIO RECEPTION

A suitable Philips Valve is available for every receiver; whether it is an old set, whose valves must be replaced by new ones, or the latest product of radio engineering .... "Miniwatt" valves always care for sufficient volume in the speaker and "true-to-life" radio music! A tremendous progress has been realised in the creation of the new "Miniwatt" Red E-series; these are valves of small dimensions requiring a considerably lower heating power and which give ideal reception in both A.C. receivers and AC/DC receivers, and also in car-radio sets. New and improved radio valves are a prime condition for modern high efficiency receivers!

"Miniwatt" valves are pillars of the bridge to greater radio enjoyment.

TYPE INDICATION OF THE "MINIWATT" VALVES

1st letter: Valve series	2nd letter: Valve type	Numeral: consecutive number
A = 4-V A.C. series B = 180 mA D.C. series C = 200 mA AC/DC series E = 6·3-volt A.C. or car-radio series F = 13-volt car-radio series H = 4-V battery series K = 2-V battery series	A = Single diode B = Double diode C = Triode, power valves excepted D = Triode output valve E = Tetrode F = Pentode, H.F. amplifier H = Hexode K = Octode L = Output pentode M = tuning indicator X = Full-wave gasfilled rectifier Y = Half-wave H.V. rectifier Z = Full-wave H.V. rectifier	When a new type of a certain valve construction is introduced this is indicated by the next higher consecutive number.

For the older types the former type indication still applies.

APPLICATION

1 = H.F. amplifier
2 = L.F. amplifier
3 = oscillator
4 = Converter valve (oscillator-modulator)
5 = Modulator
6 = Grid detector followed by transformer coupling
7 = Grid detector followed by resistance coupling
8 = Biased detector followed by resistance coupling
9 = Diode detector and L.F. amplifier
10 = L.F. amplifier followed by transformer coupling
11 = L.F. amplifier followed by resistance coupling
12 = Power amplifier
13 = Diode detector
14 = Tuning indicator
15 = Push-pull amplifier driven up to the grid current point.
16 = Push-pull amplifier driven into grid current.

TYPE INDICATION OF THE CATHODE RAY TUBES

1st letter	2nd letter	Numeral before the stroke	Numeral after the dash
Kind of deflection of the electron ray	Colour of luminous spot on fluorescent screen	Diameter of the fluorescent screen in cm	Consecutive number
D = Double electrostatic deflection S = Electrostatic deflection in one direction only (the deflection in the other direction can be effected by electro-magnetic means.) M = Magnetic deflection in both directions.	G = green B = blue W = white N = screen with long persistence time	7 = a tube with a useful screen diameter of 7 cm 9 = a tube with a useful screen diameter of 9 cm. etc.	When a new make-up of a certain tube construction is introduced this is indicated by the next higher consecutive number.

With this sytem the first letter indicates the kind of deflection of the electron ray, i.e. whether it is effected by electrostatic or electro-magnetic means. The second letter indicates the colour of the luminous spot on the fluorescent screen and the subsequent numeral states the approximate diameter of the screen in cm. The numeral after the dash is a consecutive number for the different make-ups or newer types. Thus, for instance, the type number DG 16-1 stands for the first make-up of a cathode ray tube with double electro-static deflection, green luminescing screen material and a screen diameter of 16 cm.

RED "MINIWATT" E-VALVES

6·3-volt A.C. valves and 200-mA AC/DC valves with quick-heating cathodes and side-contact bases.

Type Number	Valve type	Maximum dimensions mm	Base (Connection reference in brackets) [1]	Application (see p. 2)	Filament data: Heating	Filament data: Voltage Volts	Filament data: Current Amps.	Anode voltage Va Volts	Anode current Ia mA	Neg. grid bias Vg_1 Volts	Screen-grid voltage Vg_2 Volts	Screen-grid current Ig_2 mA	Voltage on grids 3 (and 5) $Vg_3(_5)$ Volts	Voltage on grid 4 Vg_4 Volts	Mutual conduct. S mA/V	Amplification factor μ	Internal resistance Ri Ohms	External anode resist. or optimum matching imped. Ra Ohm	Output at 10 % distortion Wo Watts	Grid A.C. voltage at the indicated output Vi $V_{R.M.S.}$	Max. anode dissipation Wa_{max} Watts	Grid anode capacity Cag_1 μμF	Type Number
EK2	Octode	90×32	P26 (38)	4	indir.	6,3	0,200	250	1,2[2] <0,015	0	200	2,1[3]	50	—2 —25	0,55[4] <0,002	—	1,5.10⁶ >10⁷	—	—	—	—	<0,07[5]	EK2
								100	1[2] <0,015	0	100	1,5[6]	50	—2 —25	0,55[4] <0,002	—	1,2.10⁶ >10⁷	—	—	—	—		
								250	2,1[7] <0,015	0	200	4 [8]	80	—4 —40	0,55[4] <0,002	—	0,9.10⁶ >10⁷	—	—	—	—		
EH2	Variable-Mu Heptode	90×32	P26 (36)	5	indir.	6,3	0,200	250	1,85[9] <0,015	—3 —25	100	Ig_2+Ig_4 =3,8 mA	Rg_3= 0,5 MΩ	100	0,4[4] <0,01	—	2.10⁶ >10⁷	—	—	—	—	<0,0015	EH2
				1, 2	indir.	6,3	0,200	250	4,2 <0,015	—3 —25	100	Ig_2+Ig_4 =2,8 mA	—3 —25	100	1,4 <0,002	—	1.10⁶ >10⁷	—	—	—	—		
EF5	Variable-Mu Pentode	90×32	P26 (34)	1, 2	indir.	6,3	0,200	250	8 <0,015	—3 —50	100	2,6	0	—	1,7 <0,002	2000	1,2.10⁶ >10⁷	—	—	—	—	<0,003	EF5
								100	8 <0,015	—3 —50	100	2,6	0	—	1,7 <0,002	500	0,30.10⁶ >10⁷	—	—	—	—		
EF6	H.F. Pentode	90×32	P26 (34)	1 2, 7 8, 11	indir.	6,3	0,200	250	3	—2	100	1,1	0	—	2,0	5000	2,5.10⁶	—	—	—	—	<0,003	EF6
								100	3	—2	100	1,1	0	—	2,0	1600	0,8.10⁶	—	—	—	—		
EB4	Duodiode with 2 separate cathodes	64×32	P26 (25)	13	indir.	6,3	0,200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	EB4
EBC3	Duodiode-Triode	90×32	P26 (28)	9	indir.	6,3	0,200	250	5	—5,5	—	—	—	—	2,0	30	15.000	—	—	—	—	1,4	EBC3
								100	2	—2,1	—	—	—	—	1,6	30	19.000	—	—	—	—		
EBL1	Duodiode and High-sensitivity Pentode	130×52	P35 (33)	13, 12	indir.	6,3	1,5	250	36	Rk =[10] 150 Ω	250	5	—	—	9,5	—	50.000	7000	4,3	3,6	9	—	EBL1
EL2	Power Pentode for car receivers	95×37	P30 (32)	12	indir.	6,3	0,2	250	32	—18	250	5	—	—	2,8	—	70.000	8000	3,6	10	8	—	EL2
EL3	High-sensitivity Power Pentode	120×37	P35 (31)	12	indir.	6,3	1,2	250	36	Rk=[10] 150 Ω	250	5	—	—	9,5	—	50.000	7000	4,3	3,6	9	—	EL3
EL5	High-sensitivity Power Pentode	117×51	P35 (31)	12	indir.	6,3	1,35	250	72	—14	275	7	—	—	8,5	—	22.000	3500	8,8	8,2	18	—	EL5
				15	indir.	6,3	1,35	250	2×58 2×65	Rk= 120 Ω	275	2×6,25 2×10,5	—	—	—	—	—	4500	0 19,5[11]	—	—		
EM1	Tuning Cross (Electron ray tuning indicator)	75×28	P26 (39)	14	indir.	6,3	0,200	250 [12] max.	0,095 0,021	0 [13] — 5[14]	—	Is=0.13 Is=0,14	—	—	—	—	—	2,0.10⁶	—	—	—	—	EM1
C/EM2	Electron ray tuning indicator	75×31	P30 (40)	14	indir.	6,3	0,200	250[15] 250[15] 250[15] 250[15] 0[16])	—	—	Vs=250 Vs=250 Vs=250 Vs=250 Vs=250	—	Vg′=+3 Vg′=0 Vg′=—6 Vg′=0 Vg′=0	Θ=160° Θ=150° Θ=0° [17]) Θ=150° Θ=95°[17])	—	—	—	—	—	—	—	—	—	C/EM2
								250[16]	3	—3,5	—	—	—	—	2,0	50	25.000	—	—	—	—		

[1]) See page 15. The numeral after the letters indicates the maximum base diameter in mm.
[2]) The data of this horizontal column apply for the oscillating condition at V_{osc} = 9 $V_{R.M.S.}$ (Ig_1 = 200 μA) and for use on long and medium waves. The grid leak resistance amounts to 50,000 ohms and is connected to the cathode.
[3]) Screen grid current $Ig_3 + Ig_5$ = 1·0 mA.
[4]) Conversion conductance.
[5]) Capacity between anode and grid 4.
[6]) Screen-grid current $Ig_3 + Ig_5$ = 1·0 mA.
[7]) The data of this horizontal column apply for the oscillating condition at V_{osc} = 6 $V_{R.M.S.}$ (Ig_1 = 150 μA) and for use of this valve in all-wave receivers. The valve must not be controlled by A.V.C. in the short wave range. The grid leak resistance amounts to 50,000 ohms and is connected to the cathode.
[8]) Screen-grid current $Ig_3 + Ig_5$ = 1·5 mA.
[9]) The data of this horizontal column apply for the oscillating condition at V_{osc} = 14 $V_{R.M.S.}$
[10]) Only with automatic grid bias. At this value of the cathode resistance the grid bias is about — 6 V.
[11]) At 5·1 % distortion.
[12]) Voltage on screen and triode series resistance.
[13]) At this voltage the fluorescent screen is covered with light sectors of 10° (measured at the edge of the screen).
[14]) At this voltage the fluorescent screen is covered with light sectors of 90° (measured at the edge of the screen).
[15]) Voltage at the triode anode.
[16]) Data for using the triode section for other amplifier purposes.
[17]) Light angle, measured at the edge of the screen.

4-VOLT A.C. VALVES WITH QUICK-HEATING CATHODES AND SIDE-CONTACT BASES

Type Number	Valve type	Maximum dimensions mm	Base (Connection reference in brackets) [1]	Application (see p. 2)	Filament data: Heating	Filament data: Voltage Volts	Filament data: Current Amps.	Anode voltage Va Volts	Anode current Ia mA	Neg. grid bias Vg_1 Volts	Screen-grid voltage Vg_2 Volts	Screen-grid current Ig_2 mA	Voltage on grids 3 (and 5) $Vg_3(_5)$ Volts	Voltage on grid 4 Vg_4 Volts	Mutual Conduct. S mA/V	Amplification factor μ	Internal resistance Ri Ohms	External anode resist. or optimum matching imped. Ra Ohm	Output at 10 % distortion Wo Watts	Grid A.C. voltage at the indicated output Vi $V_{R.M.S.}$	Max. anode dissipation Wa_{max} Watts	Grid anode capacity Cag_1 $\mu\mu F$	Type Number
AK2	Octode	116×46	P35 (38)	4	indir.	4,0	0,65	250	1,6 [2]) <0,015	—1,5	90	2,0 [3])	70	—1,5 —25	0,6 [4]) <0,002	—	1,6.10⁶ >10⁷	—	—	—	—	<0,06 [19])	**AK2**
AH1	Variable-Mu Hexode	110×46	P35 (35)	5	indir.	4,0	0,65	250	1,7 [5]) <0,15	—2,0 —24	80	2,6 [4])	—12 or Rg_3 = 0,5 MΩ	80	0,55 [4]) <0,002	—	2,0.10⁶ >10⁷	—	—	—	—	<0,003	**AH1**
				1, 2	indir.	4,0	0,65	250	3,0 <0,015	—2,0 —24	80	1,1 [6])	—2,0 —24	80	1,8 <0,002	—	2,0.10⁶ >10⁷						
AF3	Variable-Mu Pentode	106×43	P30 (34)	1, 2	indir.	4,0	0,65	250	8,0 <0,015	—3,0 —55	100	2,6	0	—	1,8 <0,002	2200	1,2.10⁶ >10⁷	—	—	—	—	<0,003	**AF 3**
AF7	Duodiode	106×43	P30 (34)	1, 2, 7 8, 11	indir.	4,0	0,65	250	3,0	—2,0	100	1,1	0	—	2,1	4200	2,0.10⁶	—	—	—	—	<0,003	**AF7**
AB2	Triode	85×29	V24 (53)	13	indir.	4,0	0,65	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	**AB2**
ABC1	Duodiode-Triode	100×37	P30 (28)	9	indir.	4,0	0,65	250	4,0	—7,0	—	—	—	—	2,0	27	13.500	—	—	—	—	—	**ABC1**
AC2	Triode	100×37	P30 (26)	3, 6 10, 11	indir.	4,0	0,65	250	6,0	—5,5	—	—	—	—	2,5	30	12.000	—	—	—	—	1,7	**AC2**
AL1	Power Pentode	115×51	P35 (30)	12	dir.	4,0	1,1	250	36	—15	250	6,8	—	—	2,8	—	43.000	7.000	3,1	9,7	9	—	**AL1**
AL2	Power Pentode	115×46	P35 (32)	12	indir.	4,0	1,0	250	36	—25	250	4			2,6	—	60.000	7.000	3,8	14	9	—	**AL2**
				15	indir.	4,0	1,0	250	2×33 2×40,5	Rk = 350 Ω	250	2×3,5 2×7	—	—	—	—	—	6600	0 11,5 [13])	—	—	—	
AL4	High-sensitivity Power Pentode	115×50	P35 (31)	12	indir.	4,0	1,75	250	36	Rk = 150 Ω [7])	250	5	—	—	9,5	—	50.000	7.000	4,3	3,6	9	—	**AL4**
ABL1	Duodiode and high sensitivity Power Pentode	130×52	P35 (33)	13, 12	indir.	4,0	2,25	250	36	Rk = 150Ω [7])	250	5	—	—	9,5	—	50.000	7.000	4,3	3,6	9	—	**ABL1**
AL5	High-sensitivity Power Pentode	117×51	P35 (31)	12	indir.	4,0	2,0	250	72	—14	275	7	—	—	8,5	—	22.000	3.500	8,8	8,2	18	—	**AL5**
				15	indir.	4,0	2,0	250	2×58 2×65	Rk = 120 Ω	275	2×6,25 2×10,5	—	—	—	—	—	4500	0 19,5 [14])	—	—	—	
AD1	Power Triode	135×58	P35 (24)	12	dir.	4,0	0,95	250	60	—45	—	—	—	—	—	4	670	2.300	4,2 [8])	30	15	—	**AD1**
				15	dir.	4,0	0,95	250	2×60 2×62,5	Rk = 375 Ω	—	—	—	—	—	—	—	4000	0 9,2 [15])	—	—	—	
AM1	Tuning Cross [9])	75×28	P26 (39)	14	indir.	4,0	0,3	250 [10]) max.	0,095 0,021	0 [11]) —5 [12])	—	Is=0,13 Is=0,14	—	—	9,5	—	—	2,0.10⁶	—	—	—	—	**AM1**
AM2	Electron ray Tuning Indicator	75×31	P30 (40)	14	indir.	4,0	0,32	250 [16]) 250 [16]) 250 [16])	—	—	Vs=250 Vs=250 Vs=250	—	Vg′=+3 Vg′=0 Vg′=—6	Θ=160° Θ=150° Θ=5° [18])	—	—	—	—	—	—	—	—	**AM2**
								250 [16]) 0 [16])	—	—	Vs=250 Vs=250	—	Vg′=0 Vg′=0	Θ=150° Θ = 95° [18])	—	—	—	—	—	—	—	—	
								250 [17])	3	—3,5	—	—	—	—	2,0	50	25.000	—	—	—	—	—	

[1]) See page 15. The numeral after the letter gives the maximum base diameter in mm.
[2]) The data of this horizontal column apply for the oscillating condition at V_{osc} = 8·5 $V_{R.M.S.}$ (Ig_1 = 100 μA) and for all-wave receivers. In the shortwave range the valve must not be controlled by A.V.C. The grid leak resistance amounts to 50,000 ohms and is connected to the neutral.
[3]) Screen-grid current $Ig_3 + Ig_5$ = 3·8 mA.
[4]) Conversion conductance.
[5]) The data of this horizontal column apply for the oscillating condition at V_{osc} = 9 $V_{R.M.S.}$
[6]) $Ig_2 + Ig_4$.
[7]) Only with automatic grid bias. At this value of the cathode resistance the grid bias is about — 6 V.
[8]) At 5 % distortion.
[9]) Electron ray tuning indicator.
[10]) Voltage at grid and triode anode series resistance.
[11]) At this voltage the fluorescent screen is covered with light sectors of 10° (measured at the edge of the screen).
[12]) At this voltage the fluorescent screen is covered with light sectors of 90° (measured at the edge of the screen).
[13]) At 3 % distortion.
[14]) At 5·1 % distortion.
[15]) At 1·3 % distortion.
[16]) Voltage at the triode anode.
[17]) Data for using the triode section for other amplifier purposes.
[18]) Light angle, measured at the edge of the screen.
[19]) Capacity between anode and grid 4.

AC/DC AND 13-V CAR-RADIO VALVES WITH SIDE CONTACT BASES

Type Number	Valve type	Maximum dimensions mm	Base (Connection reference in brackets) [15]	Application (see p. 2)	Filament data: Heating	Filament data: Voltage Volts	Filament data: Current Amps.	Anode voltage Va Volts	Anode current Ia mA	Neg grid bias Vg_1 Volts	Screen-grid voltage Vg_2 Volts	Screen grid current Ig_2 mA	Voltage on grids 3 (and 5) $Vg_3(_5)$ Volts	Voltage on grid 4 Vg_4 Volts	Mutual conduct. S mA/V	Amplification factor μ	Internal resistance Ri Ohms	External anode resist. or optimum matching imped. Ra Ohm	Output at 10 % distortion Wo Watts	Grid A.C. voltage at the indicated output $V_{R.M.S.}$ Vi	Max. anode dissipation Wa_{max} Watts	Grid anode capacity Cag_1 μμF	Type Number
CK1	Octode	116×46	P35 (38)	4	indir.	13	0,200	200	1,6 [1] <0,015	—1,5	90	2 [2]	70	—1,5 —25	0,6 <0,002	—	1.5.10⁶ >10⁷	—	—	—	—	<0.06 [3]	CK1
								100	1,6 [1] <0,015	—2	90	2 [2]	70	—1,5 —25	0,55 <0,002	—	1,0.10⁶ >10⁷						
CH1	Variable-Mu Hexode	110×46	P35 (35)	5	indir.	13	0,200	200	2,2 [4] <0,15	—2 —24	100	4 [5]	—12 [6] or Rg_3 =0,5 MΩ	50	0,55 <0,002	—	2,0.10⁶ >10⁷	—	—	—	—	<0,003	CH1
				1, 2	indir.	13	0,200	200	4,0 <0.015	—2 —24	100	2,0 [7]	—2 —24	50	2.0 <0,002	—	2,0.10⁶ >10⁷						
CF3	Variable-Mu Pentode	106×43	P30 (34)	1, 2	indir.	13	0,200	200	8,0 <0,015	—3 —55	100	2,6	0	—	1,8 <0,002	1600	0,9.10⁶ >10⁷	—	—	—	—	<0,003	CF3
								100	8,0 <0.015	—3 —55	100	2,6	0	—	1,8 <0,002	450	0.25.10⁶ >10⁷						
CF2	Variable-Mu Pentode	109×43	P30 (34)	1, 2	indir.	13	0,200	200	4,5 <0,015	—2 —22	100	1,4	0	—	2,2 <0,002	3000	1,4.10⁶ >10⁷	—	—	—	—	<0,003	CF2
								100	4,5 <0,015	—2 —22	100	1,4	0	—	2.2 <0.002	800	0,4.10⁶ >10⁷						
CF7	H.F. Pentode	106×43	P30 (34)	1, 2, 7, 8, 11	indir.	13	0,200	200	3	—2	100	1,1	0	—	2,1	4200	2.0.10⁶	—	—	—	—	<0,003	CF7
								100	3	—2	100	1,1	0	—	2,1	1500	0,7.10⁶						
CF1	H.F. Pentode	109×43	P30 (34)	1, 2, 7, 8, 11	indir.	13	0,200	200	3	—2	100	0,9	0	—	2,3	4000	1,7.10⁶	—	—	—	—	<0,003	CF1
								100	3	—2	100	0,9	0	—	2,3	1400	0,6.10⁶						
CB1	Duodiode	89×29	V24 (54)	13	indir.	13	0,200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	CB1
CB2	Duodiode	81×29	V24 (53)	13	indir.	13	0,200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	CB2
CBC1	Duodiode-Triode	100×37	P30 (28)	9	indir.	13	0,200	200	4,0	—5	—	—	—	—	2,0	27	13.500	—	—	—	—	—	CBC1
								100	2,0	—2,5	—	—	—	—	1,8	27	15.000						
CC2	Triode	100×37	P30 (26)	3, 6, 10, 11	indir.	13	0,200	200	6,0	—1,5	—	—	—	—	2,5	30	12.000	—	—	—	—	1,7	CC2
								100	2,0	—1,5	—	—	—	—	1,8	30	16.000						
CL1	Power Pentode	109×43	P30 (32)	12	indir.	13	0,200	200	25	—14	200	—	—	—	2,5	—	50.000	8.000	1,7	9	5	—	CL1
CL2 [8]	Power Pentode	123×46	P35 (32)	12	indir.	24	0,200	200	40	—19	100	—	—	—	3.1	—	23.000	5.000	3,0	8.8	8	—	CL2
								200	40	—11	75	—	—	—	3,7	—	19.000	5.000	2,5	6.9	8		
								100	50	—15	100	—	—	—	3.8	—	16.000	2.000	1,7	9,7	5	—	
CL4 [8][9]	High-sensitivity Power Pentode	127×50	P35 (32)	12	indir.	33	0,200	200	45	—8,5 [10]	200	6,0	—	—	8,0	—	35.000	4.500	4	5	9	—	CL4
CBL1 [8][9]	Duodiode and high-sensivity Power Pentode	130×52	P35 (33)	13, 12	indir.	44	0,200	200	45	—8,5 [10]	200	6,0	—	—	8,0	—	35.000	4.500	4	5	9		CBL1
EM1	Tuning Cross [13]	75×27	P26 (39)	14	indir.	6,3	0,200	200 [14]	0.075 0,020	0 —4	—	Is=0.13 Is=0,14	—	Θ=10° [14] Θ=90° [14]	—	—	—	2,0.10	—	—	—	—	EM1
C/EM2	Electron ray Tuning Indicator	75×31	P30 (40)	14	indir.	6,3	0,200	200 [11] 200 [11] 200 [11]	—	—	Vs=200 Vs=200 Vs=200	—	Vg'=+3 Vg'=0 Vg'=-4,5	Θ=160° Θ=150° Θ=5° [14]	—	—	—	—	—	—	—	—	C/EM2
								200 [11] 0 [11]	—	—	Vs=200 Vs=200	—	Vg'=0 Vg'=0	Θ=150° Θ=90° [14]	—	—	—	—	—	—	—	—	
								200 [12]	3	—2,5	—	—	—	—	2,0	50	25.000	—	—	—	—	—	

[1]) The data of this horizontal column apply for the oscillating condition at V_{osc} = 8·5 $V_{R.M.S.}$ (Ig_1 = 190 μA) and for all-wave receivers. The valve must not be controlled by A.V.C. in the short wave range. The grid leak resistance amounts to 50,000 ohms and is connected to the neutral. The figure given in column Mutual Conductance indicates the conversion conductance.

[2]) Screen-grid current $Ig_2 + Ig_5$ = 3·8 mA.

[3]) Capacity between anode and grid 4.

[4]) The data of this horizontal column apply for the oscillating condition at V_{osc} = 9 $V_{R.M.S.}$ The figure in column Mutual Conductance gives the conversion conductance.

[5]) Ig_4 = 0·1 mA.

[6]) With fixed bias.

[7]) Ig_1 = 0·25 mA.

[8]) Not for car-radio.

[9]) Only for high anode voltages.

[10]) Only for automatic grid bias (Rk = 167 ohms).

[11]) Voltage on the triode anode.

[12]) Data for using the triode section for other amplifier purposes.

[13]) Electron ray tuning indicator.

[14]) Light sector, measured at the edge of the screen.

[15]) See page 15.

4-VOLT A.C. VALVES WITH PIN BASES (INITIAL STAGES)

Type Number	Valve type	Maximum dimensions [1] mm	Base (Connection reference in brackets)	Application (see p. 2)	Filament data: Heating	Filament data: Voltage Volts	Filament data: Current Amps.	Anode voltage V_a Volts	Anode current I_a mA	Neg. grid bias V_{g_1} Volts	Screen-grid voltage V_{g_2} Volts	Screen-grid current I_{g_2} mA	Voltage on grids 3 (and 5) $V_{g_3(5)}$ Volts	Voltage on grid 4 V_{g_4} Volts	Mutual conduct. S mA/V	Amplification factor μ	Internal resistance Ri Ohms	External anode resist. or optimum matching imped. R_a Ohm	Output at 10 % distortion Wo Watts	Grid A.C. voltage at the indicated output V_i $V_{R.M.S.}$	Max anode dissipation Wa_{max} Watts	Grid anode capacity C_{ag_1} $\mu\mu F$	Type Number
AK1	Octode	118×46	C35 (12)	4	indir.	4,0	0,65	200	1,6 [3] <0,015	—1,5	90	2,0 [4]	70	—1,5 —25	—	0,6 [7] <0,002	—	1,6.10⁶ >10⁷	—	—	—	<0,06 [5]	**AK1**
ACH1	Triode-Hexode	130×50	C35 (13)	4	indir.	4,0	1,0	300	2,5 0,01	—2,0 —20	70	—	V_{osc} = 15 V [6]	70	—	0,75 [7] <0,002	—	>0,8.10⁶ >10⁷	—	—	—	<0,1 [8]	**ACH1**
								150	5,0	—	—	—	—	—	2,0	—	13	—	—	—	—	—	
E418	Hexode (oscillator-modulator)	130×50	C35 (11)	4	indir.	4 0	1,2	200	3,0	—1,5	120	8,5 [9]	200	—4 [10]	—	0,58 [11]	—	> 0,15.10⁶	—	—	—	—	**E418**
E449	Variable-Mu Hexode	130×50	C35 (11)	1, 2	indir.	4,0	1,2	200	3,0	—2 —8	80	—	—2 —8	80	3,0	1,8 <0,002	—	0,45.10⁶ >50.10⁶	—	—	—	<0,002	**E449**
E446	H.F. Penthode	138×51	O35 (23)	1, 2, 5, 7, 8, 11	indir.	4,0	1,1	200	3,0	—2,0	100	1,1	—	—	3,5	2,3	5000	2,2.10⁶	—	—	—	<0,006	**E446**
AF2	Variable-Mu Pentode	138×51	O35 (23)	1, 2, 5	indir.	4,0	1,1	200	4,25 <0,015	—2,0 —22	100	1,8	—	—	3,2	2,5 <0,002	3500	1,4.10⁶ >10⁷	—	—	—	<0,006	**AF2**
E447	Variable-Mu Pentode	138×51	O35 (23)	1, 2, 5	indir.	4,0	1,1	200	4,5 0,01	—2,0 —50	100	1,8	—	—	3,5	2,3 <0,002	2300	1,0.10⁶ >10⁷	—	—	—	<0,006	**E447**
E452T	Tetrode	129×51	O35 (22)	1, 2, 8, 7, 11	indir.	4,0	1,0	200	3,0	—2,0	100	0,7	—	—	3,0	2,0	900	450.000	—	—	—	0,003	**E452T**
E455	Variable-Mu Tetrode	127×51	O35 (22)	1, 2, 5	indir.	4,0	1,0	200	3,0 0,01	—1,5 —40	100	0,8	—	—	3,0	2,0 0,005	700	350.000 >10⁷	—	—	—	0,003	**E455**
E442	Tetrode	112×47	O35 (22)	1, 2	indir.	4,0	1,0	200	1,5	—1,3	100	0,6	—	—	1,2	0,9	700	800.000	—	—	—	0,005	**E442**
E442S	Tetrode	120×51	O35 (22)	1, 2, 8, 11	indir.	4,0	1,0	200	4,0	—2,0	60	0,5	—	—	1,1	1,0	400	400.000	—	—	—	0,02	**E442S**
E445	Variable-Mu Tetrode	127×51	O35 (22)	1, 2, 5	indir.	4,0	1,1	200	6,0 0,01	—2,0 —40	100	0,8	—	—	1,2	1,0 0,005	300	300.000 >10⁷	—	—	—	0,003	**E445**
AB1	Duodiode	91×28	O24 (21)	13	indir.	4,0	0,65	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	**AB1**
E444	Binode (Diode-Tetrode)	130×51	B35 (7)	9	indir.	4,0	1,1	200	0,35 0,9	—2,3 —2,3	33 45	—	—	—	3,0	—	1000 800	2,5.10⁶ 1,0.10⁶	0,3.10⁶ 0,1.10⁶	—	—	—	**E444**
E444S	Binode (Diode-Triode)	115×46	O35 (20)	9	indir.	4,0	1,0	200	6,0	—3,5	—	—	—	—	2,5	2,0	30	15.000	—	—	—	—	**E444S**
E499	High-Mu Triode	101×46	O35 (17)	7, 8, 11	indir.	4,0	1,0	200	0,2 0,08	—1,6 —1,6	—	—	—	—	4,0	—	99	100.000 330.000	0,3.10⁶ 1,0.10⁶	—	—	1,5	**E499**
E424N	Triode	100×46	O35 (17)	3, 6, 7, 10, 11	indir.	4,0	1,0	200	6,0	—3,5	—	—	—	—	3,5	2,4	30	12.500	—	—	—	2	**E424N**
E438	Triode	91×47	O35 (17)	7, 8, 11	indir.	4,0	1,0	200	0,3 0,1	—2,5 —2,5	—	—	—	—	1,5	—	38	120.000 400.000	0,3.10⁶ 1,0.10⁶	—	—	3	**E438**
E409	Triode	91×47	O35 (17)	3	indir.	4,0	1.0	200	12	—16	—	—	—	—	4,0	1,3	9	7.000	—	—	—	4	**E409**

[1]) Without pins.
[2]) See page 15. The figure after the letter indicates the maximum base diameter in mm.
[3]) The data of this horizontal column apply for the oscillating condition at V_{osc} = 8·5 $V_{R.M.S.}$ (I_{g_1} = 190 µA) and for all-wave receivers. The valve must not be controlled by A.V.C. in the short wave range. The grid leak resistance amounts to 50,000 ohms and is connected to the neutral.
[4]) Screen-grid current $I_{g_2} + I_{g_5}$ = 3·8 mA.
[5]) Capacity between anode and grid 4.
[6]) Across a resistance of 20,000 ohms.
[7]) Conversion conductance.
[8]) Capacity between grid 1 and grid 3.
[9]) Current of the third grid.
[10]) V_{osc} = 6·3 $V_{R.M.S.}$
[11]) Conversion conductance at V_{osc} = 6·3 $V_{R.M.S.}$

4-VOLT A.C. VALVES WITH PIN BASES (POWER STAGES)

Type Number	Valve type	Maximum dimensions [1] mm	Base (Connection reference in brackets)	Application (see p. 2)	Filament data: Heating	Filament data: Voltage Volts	Filament data: Current Amps.	Anode voltage Va Volts	Anode current Ia mA	Neg. grid bias Vg_1 Volts	Screen-grid voltage Vg_2 Volts	Screen-grid current Ig_2 mA	Voltage on grids 3 (and 5) $Vg_3(_5)$ Volts	Voltage on grid 4 Vg_4 Volts	Mutual conduct. S mA/V	Amplification factor μ	Internal resistance Ri Ohms	External anode resist. or optimum matching imped. Ra Ohm	Output at 10 % distortion Wo Watts	Grid A.C. voltage at the indicated output Vi $V_{R.M.S.}$	Max. anode dissipation Wa_{max} Watts	Grid anode capacity Cag_1 μμF	Type Number
E453	Pentode	105×51	B35 (8)	12	indir.	4,0	1,1	250	24	—15	250	—	—	—	2,5	175	70.000	15.000	2,8	8	6	—	**E453**
E463	Pentode	119×55	B35 (8)	12	indir.	4,0	1,35	250	36	—22	250	—	—	—	2,7	100	37.000	8.000	4,1	12,3	9	—	**E463**
B409	Triode	91×46	A32 (1)	12	dir.	4,0	0,15	250	12	—18	—	—	—	—	1,8	9	5.000	12.000	0,65[2])	12	3	—	**B409**
B443	Pentode	92×51	O35 (19)	12	dir.	4,0	0,15	250	12	—19	150	—	—	—	1,3	60	45.000	20.000	1,35	12,1	3	—	**B443**
B443S	Pentode	92×51	O35 (19)	12	dir.	4,0	0,15	250	12	—12	80	—	—	—	1,6	100	60.000	22.000	1,12	6,8	3	—	**B443S**
C443	Pentode	92×51	O35 (19)	12	dir.	4,0	0,25	300	20	—25	200	—	—	—	1,7	60	35.000	15.000	2,8	16	6	—	**C443**
C443N	Pentode	89×51	O35 (19)	12	dir.	4,0	0,25	300	20	—42	200	—	—	—	1 5	37	25.000	15.000	3,0	20	6	—	**C443N**
E443H	Pentode	123×55	O35 (19)	12	dir.	4,0	1,1	250	36	—15	250	—	—	—	2,8	120	43.000	7.000	3.1	9,7	9	—	**E443H**

[1]) Without pins. [2]) At 5 % distortion.

180-MA D.C. VALVES

Type Number	Valve type	Maximum dimensions [1] mm	Base (Connection reference in brackets)	Application (see p. 2)	Filament data: Heating	Filament data: Voltage Volts	Filament data: Current Amps.	Anode voltage Va Volts	Anode current Ia mA	Neg. grid bias Vg_1 Volts	Screen-grid voltage Vg_2 Volts	Screen-grid current Ig_2 mA	Voltage on grids 3 (and 5) $Vg_3(_5)$ Volts	Voltage on grid 4 Vg_4 Volts	Mutual conduct. S mA/V	Amplification factor μ	Internal resistance Ri Ohms	External anode resist. or optimum matching imped. Ra Ohm	Output at 10 % distortion Wo Watts	Grid A.C. voltage at the indicated output Vi $V_{R.M.S.}$	Max. anode dissipation Wa_{max} Watts	Grid anode capacity Cag_1 μμF	Type Number
B2046	H.F. Pentode	138×51	O35 (23)	1, 2, 5, 7. 8, 11	indir.	20	0,180	200	3,0	—2,0	100	1,1	—	—	3,5	2,2	5000	$2{,}2.10^6$	—	—	—	<0,006	**B2046**
B2047	Variable-Mu Pentode	138×51	O35 (23)	1, 2, 5	indir.	20	0,180	200	4,0	—2,0 —50	100	1,8	—	—	3,0	2.0 <0,002	2200	$1{,}1.10^6$ $>10^7$	—	—	—	<0,006	**B2047**
B2048	Hexode (oscillator modulator	130×50	C35 (11)	4	indir.	20	0,180	200	3,0	—1,5	120	8,5 [2])	200	—4 [2])	—	0,58 [4])	—	$>$ $0{,}15.10^6$	—	—	—	—	**B2048**
B2049	Variable-Mu Hexode	130×50	C35 (11)	1, 2	indir.	20	0,180	200	3	—1,5 —8	80	—	—1,5 —8	80	3	1,8 <0,002	—	$0{,}45.10^6$ $>50.10^6$	—	—	—	<0,002	**B2049**
B2052T	Tetrode	127×51	O35 (22)	1, 2, 5, 7, 8, 11	indir.	20	0,180	200	3,0	—2,0	100	0,2	—	—	3,0	2,0	900	$0{,}45.10^6$	—	—	—	0,003	**B2052T**
B2045	Variable-Mu Tetrode	120×51	O35 (22)	1, 2, 5	indir.	20	0,180	200	4,0 0.01	—2,0 —40	60	0,9	—	—	1,2	1,0 0.005	400	$0{,}4.10^6$ $>10^7$	—	—	—	0.004	**B2045**
B2044	Binode (Diode-Tetrode)	130×51	B35 (7)	9	indir.	20	0,180	200	0.29 0,76	—3,2 —4,0	40 60	—	—	—	2,8	—	700 600	$2{,}4.10^6$ $1{,}2.10^6$	$0{,}32.10^6$ $0.1.10^6$	—	—	0,003	**B2044**
B2044S	Binode (Diode-Triode)	108×46	O35 (20)	9	indir.	20	0,180	200	6,0	—3,0	—	—	—	—	2,0	1,8	30	16.000	—	—	—	—	**B2044S**
B2038	Triode	105×51	O35 (17)	3, 6, 7, 10, 11	indir.	20	0,180	200	6,0	—3,0	—	—	—	—	3,5	2,3	33	14.000	—	—	—	—	**B2038**
B2099	High-Mu Triode	101×46	O35 (17)	11	indir.	20	0,180	200	0.08 0,2	—1,6 —1,6	—	—	—	—	3,0	—	99	330.000 100.000	$0{,}32.10^6$ 1.10^6	—	—	1,5	**B2099**
B2006	Power Triode	105×51	O35 (16)	12	indir.	20	0,180	200	15	—18	—	—	—	—	2,5	1,6	6	4.000	16.000	0,21 [5])	5	—	**B2006**
B2043	Power Pentode	105×51	B35 (8)	12	indir.	20	0,180	200	20	—18	200	8	—	—	2,5	1,7	70	40.000	10.000	1,7	5	—	**B2043**

[1]) Without pins. [2]) Current of the third grid. [3]) $V_{osc} = 6{\cdot}3\ V_{R.M.S.}$ [4]) Conversion conductance at $V_{osc} = 6{\cdot}3\ V_{R.M.S.}$ [5]) At 5 % distortion.

BATTERY VALVES (Low filament current series) WITH SIDE CONTACT BASES

Type Number	Valve type	Maximum dimensions mm	Base (Connection reference in brackets) [11]	Application (see p. 2)	Filament data: Heating	Filament data: Voltage Volts	Filament data: Current Amps.	Anode voltage Va Volts	Anode current Ia mA	Neg. grid bias Vg_1 Volts	Screen-grid voltage Vg_2 Volts	Screen-grid current Ig_2 mA	Voltage on grids 3 (and 5) $Vg_{3(5)}$ Volts	Voltage on grid 4 Vg_4 Volts	Mutual conduct. S mA/V	Amplification factor μ	Internal resistance Ri Ohms	External anode resist. or optimum matching imped. Ra Ohm	Output at 10% distortion Wo Watts	Grid A.C. voltage at the indicated output Vi $V_{R.M.S.}$	Max. anode dissipation Wa_{max} Watts	Grid anode capacity Cag_1 μμF	Type Number
KK2	Octode	120×46	P35 (37)	4	dir.	2,0	0,13	135	0,7[1]) <0,015	0	135	2,1[3])	45	−0,5 −12	0,27[10]) <0,002	—	2,5.10⁶ >10⁷	—	—	—	—	<0,07[9])	**KK2**
								90	0.7[1]) <0.015	0	90	1,3[4])	45	−0,5 −12	0,27[10]) <0.002	—	2,0.10⁶ >10⁷						
								135	1,0[2])	0	135	2,3[5])	60	−1,5	0,27[10])	—	1,7.10⁶						
KF3	Variable-Mu Pentode	102×40	P30 (29)	1, 2, 5	dir.	2,0	0,045	135	2.0 <0,015	−0,5 −15	135	0,6	0	—	0,65 <0,002	850	1,3.10⁶ >10⁷	—	—	—	—	<0,006	**KF3**
								90	1.0 <0,015	−0,5 −10	90	0,3	0	—	0.5 <0.002	1000	2,0.10⁶ >10⁷						
KF4	H.F. Pentode	102×40	P30 (29)	1, 2, 7, 8, 11	dir.	2,0	0,065	135	2,6	−0,5	135	1,0	0	—	0,8	800	1,0.10⁶	—	—	—	—	<0,006	**KF4**
								90	1,2	−0,5	90	0,4	0	—	0,7	900	1,3.10⁶						
KB2	Duodiode	72×30	V24 (53)	13	indir.	2,0	0,095	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	**KB2**
KC1	Triode	90×44	P30 (24)	7, 11	dir.	2,0	0,065	135	1,2	−1,5	—	—	—	—	0,6	25	40.000	—	—	—	0,5	3,5	**KC1**
								90	0,3	−1,5	—	—	—	—	0,4	25	60.000						
KC3	Triode	92×43	P30 (24)	10	dir.	2,0	0,21	135	3,0	−2,3	—	—	—	—	2,5	30	12.000	—	—	—	—	—	**KC3**
KBC1	Duodiode-Triode	112×47	P35 (27)	9	dir.	2,0	0,1	135	2,5	−4,5	—	—	—	—	1,0	16	16.000	—	—	—	—	—	**KBC1**
								90	1,0	−3,0	—	—	—	—	0,7	16	23.000						
KL4	Power Pentode	100×42	P35 (30)	12	dir.	2,0	0,14	135	6,5	−5	135	1,0	—	—	2,1	—	150.000	19.000	0,44	3,3	1,0	—	**KL4**
								90	4,7	−2,6	90	0,7	—	—	1,8	—	170.000	19.000	0,16	2.0			
KDD1	Double Triode	92×43	P30 (47)	16	dir.	2,0	0,22	135	2×1,5[6])	0	—	—	—	—	—	—	—	10.000[7])	2,0[8])	—	—	—	**KDD1**

[1]) The data of this horizontal column apply for the oscillating condition at V_{osc} = 8·5 $V_{R.M.S.}$ (Ig_1 = 100 μA) and for long and medium wave reception. The grid leak resistance amounts to 50,000 ohms and is connected to the neutral.

[2]) The data of this horizontal column apply for the oscillating condition at V_{osc} = 6 $V_{R.M.S.}$ (Ig_1 = 60 μA) and for short wave reception. In this range the valve must not be controlled by A.V.C. The grid leak resistance amounts to 50,000 ohms and is connected to the neutral.

[3]) Screen-grid current $Ig_3 + Ig_5$ = 0·7 mA.

[4]) Screen-grid current $Ig_3 + Ig_5$ = 0·6 mA.

[5]) Screen-grid current $Ig_3 + Ig_5$ = 1·0 mA.

[6]) Quiescent current, anode current at full load = 2 × 14 mA.

[7]) From anode to anode.

[8]) Ratio of intervalve transformer = 2 : (1 + 1) (primary to secundary turns). Driver valve KC 3, required A.C. voltage on grid of KC 3 = 2 $V_{R.M.S.}$

[9]) Capacity between anode and grid 4.

[10]) Conversion conductance.

[11]) See page 15. The numeral after the letter gives the maximum base diameter in mm.

PHILIPS NEON TUNING INDICATOR

Type Number	Dimensions without pins mm	Base (Connection reference in brackets)	Striking voltage at the auxiliary anode Va_2 Volts	Operating voltage at the main anode Va_1 Volts	Main anode current at fully lighted cathode Va_1 mA	Auxiliary anode current Ia μA
4662	98×13	Small, 4-pin (XV, see page 12)	165—190	150—170	2	40—50

BATTERY VALVES WITH PIN BASES

Type Number	Valve type	Maximum dimensions mm	Base (Connection reference in brackets)	Application (see p. 2)	Filament data: Heating	Filament data: Voltage Volts	Filament data: Current Amps.	Anode voltage Va Volts	Anode current Ia mA	Neg. grid bias Vg_1 Volts	Screen-grid voltage Vg_2 Volts	Screen-grid current Ig_2 mA	Voltage on grids 3 (and 5) $Vg_{3(5)}$ Volts	Voltage on grid 4 Vg_4 Volts	Mutual conduct. S mA/V	Amplification factor μ	Internal resistance Ri Ohms	External anode resist. or most fav. matching imped. Ra Ohms	Output at -10 % distortion Wo Watts	Grid A.C. voltage at the indicated output Vi $V_{R.M.S.}$	Max. anode dissipation Wa_{max} Watts	Grid anode capacity Cag_1 $\mu\mu F$	Type Number
KF2	Variable-Mu Pentode	118×47	C35 (10)	1,2	dir.	2,0	0,2	135	3,0 appr 0,01	0 —16	135	1,0	0	—	1,3	1.3 <0,002	1400	$1{,}1.10^6$ $>10^7$	—	—	—	<0,01	**KF2**
								90	1,4 appr 0,01	0 —11	90	—	0	—	—	0,8 <0.002	1500	$1{,}9.10^6$ $>10^7$					
KF1	H.F. Pentode	118×47	C35 (10)	1, 2, 7, 8, 11	dir.	2,0	0,2	135	3,0	0	135	1,0	0	—	1,8	1,8	1600	$0{,}9.10^6$	—	—	—	<0,01	**KF1**
								90	1,1	0	90	—	0	—	—	1,0	1500	$1{,}5.10^6$					
B228	Triode	81×41	A32 (1)	7, 11	dir.	2,0	0,1	150	2,0	—2,0	—	—	—	—	1,3	1,2	28	23.000	—	—	—	5,5	**B228**
B217	Triode	81×41	A32 (1)	3, 6, 10	dir.	2,0	0,1	150	4,5	—3,0	—	—	—	—	1,4	1,3	17	13.000	—	—	—	5,5	**B217**
C243N	Power Pentode	89×51	O35 (19)	12	dir.	2,0	0,2	150	9,5	—4,5	150	—	—	—	—	2,4	—	75.000	15.000	0,58	1,5	—	**C243N**
B240	Double Triode	96×47	C35 (9)	16	dir.	2,0	0,2	150	2×1,5[1]	0	—	—	—	—	—	—	—	—	14.000[2]	1,0[9]	—	—	**B240**
B442	Tetrode	108×46	A35 (3)	1, 2	dir.	4,0	0,100	200	4,5	—1,0	100	—	—	—	0,9	0,9	350	$0{,}4.10^6$	—	—	—	0,005	**B442**
A442	Tetrode	105×46	A35 (3)	1, 2, 5, 7, 8, 11	dir.	4,0	0,06	200	4,0	—1,0	100	—	—	—	0,8	0,7	280	$0{,}4.10^6$	—	—	—	0,01	**A442**
B424	Triode	92×46	A35 (1)	3. 6, 10	dir.	4,0	0,100	200	6,0	—0,3	—	—	—	—	3,0	2,5	24	9.000	—	—	—	4	**B424**
B438	Triode	78×38	A35 (1)	7, 8, 11	dir.	4,0	0,100	200	0.2 0.05	—2,5 —2,5	—	—	—	—	2,0	—	38	170.000 400.000	$0{,}32.10^6$ $1{,}0.10^6$	—	—	—	4	**B438**
A415	Triode	83×42	A32 (1)	3, 6, 10	dir.	4,0	0,085	150	4,0	—4,0	—	—	—	—	2,0	1,5	15	10.000	—	—	—	—	4,5	**A415**
A425	Triode	83×42	A32 (1)	7, 8, 11	dir.	4,0	0,065	200	0,25 0,1	—2,5 —2,5	—	—	—	—	1,2	—	25	80.000 250.000	$0{,}32.10^6$ $1{,}0.10^6$	—	—	—	3	**A425**
A409	Triode	83×42	A32 (1)	3, 6, 10	dir.	4,0	0,065	150	3,5	—9,0	—	—	—	—	1,2	0,9	9	10.000	—	—	—	4	**A409**
A441N	Double-grid valve	92×46	A35b (4)	4	dir.	4,0	0.08	100	4,0	0[4]	4,0[8]	—	—	—	—	0,3[3] 1,0[7]	—	—	—	—	—	—	**A441N**
B405	Triode	91×46	A32 (1)	12	dir.	4,0	0,15	150	11	—18	—	—	—	—	2,0	1,6	5	3.000	—	—	—	—	**B405**
B406	Triode	91×46	A32 (1)	12	dir.	4,0	0,1	150	8	—15	—	—	—	—	1,4	1,3	6	4.500	—	—	—	—	**B406**
B409	Triode	91×46	A32 (1)	12	dir.	4,0	0,15	250	12	—16	—	—	—	—	2.0	1,8	9	5.000	12.000	0,65[9]	3	—	**B409**
B443	Power Pentode	92×51	O35 (19)	12	dir.	4,0	0,150	250	12	—17	150	—	—	—	—	1,3	—	45.000	20.000	1,35	3	—	**B443**

[1]) Quiescent anode current for both anodes.
[2]) From anode to anode.
[3]) At Va = 120 volts.
[4]) Voltage of the control grid.
[5]) Voltage of the space charge grid.
[6]) Conductance of control grid.
[7]) Conductance of space charge grid.
[8]) Without pins.
[9]) At 5 % distortion.

PHILIPS POWER AMPLIFIER VALVES

Type Number	Valve type	Maximum Dimensions[1] mm	Base (Connection reference in brackets) [7]	Filament data: Heating	Filament data: Voltage Volts	Filament data: Current Amps	Application	Anode Voltage Va Volts	Screen-grid voltage Vg_2 Volts	Quiescent anode current Ia_0 mA	Anode current at full modulat. Ia_{max} mA	Quiescent Screen-grid current Ig_{2_0} mA	Screen-grid current at full modulat. Ig_{2max} mA	Neg. grid bias for fixed bias Vg_1 Volts	Common cathode resist. with autom. bias Rk Ohms	Mutual conduct. at working point S mA/V	Internal resist. at working point Ri Ohms	Optim. matching imped. (between the two anodes) Ra Ohms	Max. output Wo_{max} Watts	Distortion at max. output dtot %	Grid A.C. voltage at full modulat. Vi_{max} $V_{R.M.S.}$	Max. anode load Wa_{max} Watts	Type Number
E406N	Triode	130×51	A35 (1)	dir.	4,0	1,0	Class A, 1 valve	500	—	24	—	—	—	—68	—	3,0	2000	11.500	5.3	5	45	12	**E406N**
							Class AB, 2 valves	500	—	2×23	2×38	—	—	—70	—	—	—	12.000	15	1,4	43	12	
							Class AB, 2 valves	500	—	2×24	2×27	—	—	—	1400	—	—	16.000	13	3,3	52	12	
E408N	Triode	121×51	A40 (1)	dir.	4,0	1,0	Class A, 1 valve	400	—	30	—	—	—	—36	—	2,7	3000	6.000	2,6	5	—	12	**E408N**
							Class AB, 2 valves	400	—	2×20	2×28	—	—	—40	—	—	—	12.000	7	0,56	28	12	
							Class AB, 2 valves	400	—	2×31	2×32	—	—	—	600	—	—	10.000	7	0,62	26,5	12	
E443N	Pentode	110×57	O40 (19)	dir.	4,0	1,0	Class A, 1 valve	400	200	30	—	—	—	—40	—	1,9	40.000	14.000	5,4	10	20,2	12	**E443N**
							Class AB, 2 valves	400	200[6]	2×25	2×28	2×4,7	2×10	—	720	—	—	16.000	14	4,1	—	12	
E451	Double-grid power valve	123×55	O35 (18)	dir.	4,0	1,1	Class A, 1 valve	250	—	22	—	—	—	—33[2]	—	2,4	2400	6.400[4]	1,25	5	—	10	**E451**
							Class B, 2 valves	300	—	2×6	2×48	—	—	0[3]	—	—	—	6.000	16	8,4[5]	—	—	
							Class B, 2 valves	400	—	2×8,5	2×56	—	—	0[3]	—	—	—	6.000	22,4	5,4[5]	—	—	
E707	Triode	200×51	W42 (56)	dir.	7,2	1,1	Class A, 1 valve	800	—	40	—	—	—	—80	—	2.0	3500	11.000	10	5	58	32	**E707**
							Class AB, 2 valves	800	—	2×30	2×52	—	—	—87	—	—	—	10.000	23	1,3	55	32	
							Class AB, 2 valves	800	—	2×40	2×45	—	—	—	1000	—	—	12.000	24	1,3	61	32	
F410	Triode	145×60	A40 (1)	dir.	4,0	2,0	Class A, 1 valve	550	—	45	—	—	—	—36	—	4,0	2500	7.000	5,9	5	24,5	25	**F410**
							Class AB, 2 valves	550	—	2×20	2×40	—	—	—43	—	—	—	10.000	14,6	1,08	28	25	
							Class AB, 2 valves	550	—	2×45	2×48	—	—	—	400	—	—	10.000	14,4	0,86	25	25	
F443N	Pentode	160×67	O40 (19)	dir.	4,0	2,0	Class A, 1 valve	550	200	45	—	1,4	—	—30	647	3,2	30.000	12.000	12	10	12,5	25	**F443N**
							Class A, 1 valve	300	300	83	—	4.6	—	—40	457	3,9	20.000	3.500	10,3	10	20	25	
							Class AB, 2 valves	550	250[6]	2×45	2×53	2×0,8	2×7,4	—	455	—	—	12.000	41	4,3	37	25	
							Class AB, 2 valves	300	300[6]	2×15	2×72,5	2×0,54	2×14,3	—63	—	—	—	4.500	26,5	3,4	46	25	
							Class AB, 2 valves	300	300[6]	2×64	2×72,5	2×2,0	2×11,9	—	340	—	—	4.000	24	2,9	39	25	
4641	Triode	165×66	W42 (56)	dir.	4,0	2,0	Class A, 1 valve	1000	—	25	—	—	—	—80	—	3,2	3200	25.000	11,5	5	58	25	**4641**
							Class AB, 2 valves	1000	—	2×25	2×39	—	—	—80	—	—	—	35.000	30	0,67	56	25	
							Class AB, 2 valves	1000	—	2×25	2×28	—	—	—	1600	—	—	35.000	29	4,5	55	25	
							Class B, 2 valves	1000	—	2×5	2×45	—	—	—90	—	—	—	18.000	41	4,0	60	25	
4682	Pentode	115×46	P35 (32)	indir.	4,0	1,0	Class AB, 2 valves	375	250[6]	2×20	2×45	2×3	2×5,5	—32	—	—	—	9.000	19	1,5	21,5	9	**4682**
								375	250[6]	2×24	2×29	2×3,5	2×4	—	540	—	—	15.000	14	5,2	16,5	9	
4683	Triode	135×59	P35 (24)	dir.	4,0	0,95	Class AB, 2 valves	350	—	2×35	2×69,5	—	—	—75	—	—	—	5.000	20	2,1	49	15	**4683**
								350	—	2×43	2×46,5	—	—	—	850	—	—	8.000	15,6	2,3	51	15	
4684	Pentode	115×50	P35 (31)	indir.	4,0	1,75	Class AB, 2 valves	375	250[6]	2×24	2×30	2×3,2	2×5 3	—	142	—	—	13.000	12	2,3	6,9	9	**4684**
4688	Pentode	117×51	P35 (31)	indir.	4.0	2,0	Class AB, 2 valves	375	275[6]	2×48	2×62	2×5	2×9	—	165	—	—	6.500	28,5	2,25	16	18	**4688**
4689	Pentode	117×51	P35 (31)	indir.	6,3	1,35	Class AB, 2 valves	375	275[6]	2×48	2×62	2×5	2×9	—	165	—	—	6.500	28,5	2,25	16	18	**4689**
4694	Pentode	120×37	P35 (31)	indir.	6.3	1,2	Class AB, 2 valves	375	250[6]	2×24	2×30	2×3,2	2×5,3	—	142	—	—	13.000	12	2,3	6,9	9	**4694**

[1]) Without pins.
[2]) Anode and grid 2 interconnected, class A as driver valve.
[3]) Grids 1 and 2 interconnected, class B driven into grid current.
[4]) Optimum external resistance for maximum power output. About double the value is recommended as load when using this valve as driver valve of class B power stages driven into grid current.
[5]) Measured with a valve E 451 as driver (Va = 250 V, Vg = — 33 V) and an intervalve transformer with a ratio 2·5 : (1 + 1) (primary to secundary turns).
[6]) The screen-grid voltage must be maintained as constant as possible in push-pull stages by a chain of neon stabiliser tubes. The tubes type 4687 are very suitable for the purpose.
[7]) See page 15. The numeral after the letter gives the maximum base diameter in mm.

PHILIPS RECTIFIER VALVES

for Receivers, Power Amplifiers and Cathode Ray Tubes

		Type Number	Maximum Dimensions [2] mm	Base (Connection reference in brackets)	Filament data			Anode data	
					Heating	Voltage Volts	Current appr. amps.	Max. A.C. no. load voltage Volts R.M.S.	Max. D.C. current mA
For A.C. mains receivers	Full-wave high-vacuum	EZ4	85×37	P30 (45)	indir.	6,3	0,9	2×400	175
		AZ1	110×53	P35 (44)	dir.	4,0	1,1	2×500 2×300	60 100
		1801	93×47	A35 (5)	dir.	4,0	0,5	2×250	30
		506	105×51	A35 (5)	dir.	4,0	1,0	2×300	75
		1817	160×67	A40 (5)	dir.	4,0	4,0	2×350	300
		1805	116×53	A35 (5)	dir.	4,0	1,0	2×500	60
		1561	125×51	A35 (5)	dir.	4,0	2,0	2×500 2×350	120 160
		1815	145×59	A40 (5)	dir.	4,0	2,5	2×500	180
		1831	145×59	A35 (5)	dir.	4,0	1,0	2×700	60
	Half-wave high-vacuum	1802	92×46	H32 (14)	dir.	4,0	0,4	250	30
		1803	100×52	H35 (14)	dir.	4,0	0,6	500	30
		1832	145×60	H35 (14)	dir.	4,0	1,3	700	120
For AC/DC receivers	Half-wave high-vac.	CY1	102×43	P30 (43)	indir.	20	0,200	250	80
		CY2	100×44	P30 (46)	indir.	30	0,200	1×250 2×127 [1]	120 60
For car-radio receivers	Full-wave high-vac.	EZ2	85×37	P30 (45)	indir.	6,3	0,4	2×350	60
		FZ1	91×37	P30 (45)	indir.	13	0,25	2×250	50
For amplifier installations	Full-wave gas-filled	AX1	110×47	A35 (5)	dir.	4,0	2,0	2×500 [3]	125
	Half-wave high-vac.	4646	145×60	W42 (55)	dir.	4,0	1,3	1000	75
For cathode ray oscillographs	Half-wave high-vac.	1875	145×50	P35 (42)	dir.	4,0	2,3	7000	5
		1876	97×52	P35 (41)	dir.	4,0	0,3	850	5
—	gasfilled	1018 [4]	—	—	dir.	1,8	1,8	16	200

[1] As voltage doubler. [2] Without pins. [3] Voltage drop in the valve = 15 V.
[4] Rectifier for charging purposes.

PHILIPS HEATING CURRENT REGULATOR TUBES

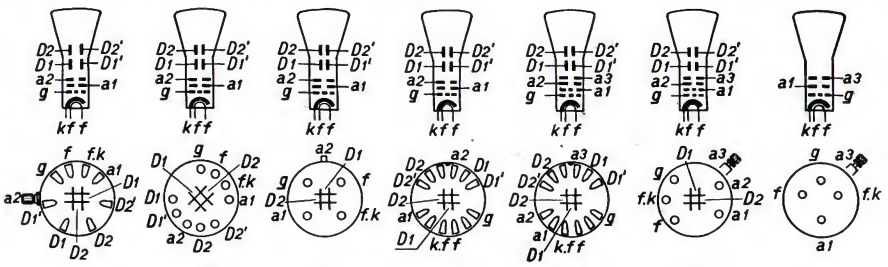
	Type Number	Maximum dimensions [6] mm	Base (Connection reference in brackets)	Voltage control range Volts	Maximum operating voltage Volts	Regulated current rating mA	Max. voltage across the tube when switching on Volts
For AC/DC valves without switching on current limiting resistance	C1	125×39	P30 (48)	80—230	200	200	250 [2]
	C2	115×39	P30 (48)	35—100	100	200	160 [2]
	C8	125×39	P30X (50)	80—230	200	200	250 [1]
	C9	115×39	P30Z (52)	35—100	100	200	160 [2]
	C10	115×39	P30Y (51)	35—100	100	200	160 [2]
	C12	142×41	P30 (49)	80—200 35—100	200 100	200	250 [1] 160 [2]
For AC/DC valves with a switching on current limiting resistance	C3	125×39	P30X (50)	100—200	200	200	250
	C4	105×39	P30Y (51)	55—105	105	200	160
	C6	125×39	P30 (48)	70—140	140	200	160
	C7	105×39	P30 (48)	35—70	70	200	110
For indir. heated D.C. valves	1926 [4]	105×33	A32 (6)	16 [5]	—	180	—
	1927	115×38	A35 (6)	35—100	—	180	—
	1928	125×38	A35 (6)	100—225	—	180	—
For dir. heated D.C. valves	1904	90×36	A32 (6)	50—70	—	100	—
	1911	90×36	A32 (6)	50—70	—	150	—
	1915	115×38	A32 (6)	50—70	—	240	—
	1920	115×38	A32 (6)	50—70	—	250	—
For indir. heated valves	1941	140×50	A35 (6)	77—200	200	300	250 [1]
	1949	95×38	A35 (6)	30—90	90	300	127 [3]
	1910	90×33	H32 (15)	4,5—14,5	—	1440	—

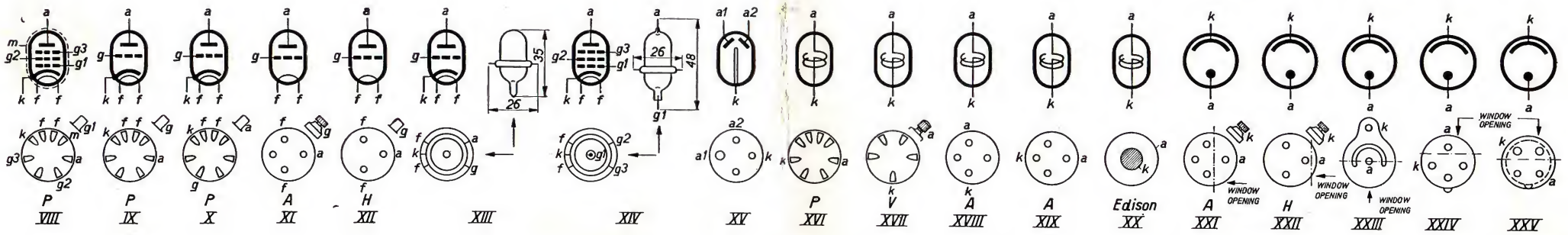
[1] The total heating current of the receiving valves in series with the regulator tube must be at least 52 volts.
[2] The total heating current of the receiving valves in series with the regulator tube must be at least 74 volts.
[3] The total heating current of the receiving valves in series with the regulator tube must be at least 63 volts.
[4] Resistance tube.
[5] Voltage drop in the resistance.
[6] Without pins.

PHILIPS' HIGH-VACUUM CATHODE RAY TUBES

Type Number	Tube type	Deflection	Colour of luminous spot	Max. screen diameter mm	Greatest length without pins (max.)	Greatest length without pins (min.)	Base connection	Filament data: Heating	Filament data: Voltage Volts	Filament data: Current Amps	Max. voltage on 3rd anode Va_{3max} Volts	Max. voltage on 2nd anode Va_{2max} Volts	Max. voltage on 1st anode Va_{1max} Volts	Max. grid bias for suppr. of the ray Vg_{max} Volts		Operating data: Voltage on 3rd anode Va_3 Volts	Operating data: Voltage on 2nd anode Va_2 Volts	Operating data: Voltage on 1st anode Va_1 Volts	Operating data: Voltage of grid Vg Volts	Operating data: Sensitivity [2] N_1 mm/V	Operating data: Sensitivity [3] N_2 mm/V	Grid capacity [4] Cg µµF	Capacity of deflection plates [5] $C_{D_1D_1'}$	Capacity of deflection plates [6] $C_{D_2D_2'}$	Type Number
DG7-1	Cathode ray tube for oscilloscopes	Double electrostatic	Green	75	165	150	I	indir.	4,0	1,0	—	800	300	—30	The grid voltage may never become positive	—	800	200 [1]	The grid voltage must be adjusted to the desired light intensity.	0,20	0,14	7	3	4	**DG7-1**
																—	500	140 [1]		0,32	0,22				
DG9-3 [7]	Cathode ray tube for oscilloscopes	Double electrostatic	Green	103	350	320	II	indir.	4,0	1,0	—	1200	500	—40		—	1000	400 [1]		0,40	0,30 [11]	6	4	5,5	**DG9-3**
DG16-1 [8]	Cathode ray tube for oscilloscopes	Double electrostatic	Green	167	440	416	III	indir.	4,0	1,0	—	2000	600	—40		—	2000	400 [1]		0,27	0,20	10	1,5	2	**DG16-1**
																—	1000	200 [1]		0,54	0,40				
DG16-2 [9]	Cathode ray tube for oscilloscopes	Double electrostatic	Green	167	450	425	IV	indir.	4,0	1,0	—	2000	600	—40		—	2000	400 [1]		0,27	0,20	12	6	7	**DG16-2**
																—	1000	200 [1]		0,54	0,40				
DG25-1 [10]	Cathode ray tube for oscillographs and television receivers	Double electrostatic	Green	257	580	550	V	indir.	4,0	1,2	5000	1700	250	—60		5000	1400 [1]	250		0,13	0,11	15	5,5	6,5	**DG25-1**
DW31-1 [13]	Cathode ray tube for television receivers	Double electrostatic	White	310	640	610	VI	indir.	4,0	1,2	6000	1200	250	—60		5000	1000 [1]	250		0,17	0,13	15	4	5	**DW31-1**
MW31-2	Cathode ray tube for television receivers	Double magnetic	White	310	695	660	VII	indir.	4,0	1,2	6000	magnetic concentration	250	—60		5000	—[12]	250		1,8 [14]	1,8 [14]	—	—	—	**MW31-2**
DW39-1	Cathode ray tube for television receivers	Double electrostatic	White	395	765	735	VI	indir.	4,0	1,2	6000	1200	250	—60		5000	1000 [1]	250		0,18	0,14	15	4	5	**DW39-1**
MW39-2	Cathode ray tube for television receivers	Double magnetic	White	395	745	700	VII	indir.	4,0	1,2	6000	magnetic concentration	250	—60		5000	—[12]	250		2,3 [14]	2,3 [14]	—	—	—	**MW39-2**

1) Set to spot sharpness.
2) Of the deflection plates on the cathode side.
3) Of the deflection plates on the screen side.
4) With respect to all other electrodes.
5) On the cathode side.
6) On the screen side.
7) This tube can also be supplied with a blue screen (type number DB 9-3).
8) This tube can also be supplied with a blue screen (DB 16-1) or with a white screen (DW 16-1).
9) This tube can also be supplied with a blue screen (DB 16-2) or a long persistence yellow fluorescent screen (DN 16-2).
10) This valve can also be supplied with a blue fluorescent screen (DB 25-1).
11) The deflection of the deflection plates D_2 and D_2' is asymmetrical to enable asymmetrical control by means of a simple time-base voltage or amplifier circuit (control voltage that fluctuates only in one direction with respect to Va_2). The plate D_2' must be connected to anode a_2. Plate D_2 can then be connected to the asymmetrical time-base voltage or output voltage of the amplifier.
12) The number of turns required for magnetic concentration is about 500. The distance of the coil centre from the lower edge of the base must be about 140 mm.
13) The newer type, the DW 31-2, is fitted with deflection plates led out at the base.
14) Expressed in mm deflection per cm coil width (length of the field through which the electrons of the ray pass) per Gauss mean field-strength .The distance of the coil centre to the screen is 420 mm for tube MW 31-2 and 540 mm for tube MW 39-2.





PHILIPS NEON STABILISER TUBES

Type Number	Maximum dimensions without pins mm	Base (Connection reference in brackets, see p. 12)	Running voltage at the given quiescent current Volts	Striking voltage Volts	Extinction voltage Volts	Quiescent current at the given running voltage mA	Maximum permissible current mA	Lower current limit for stabilisation mA	A.C. resistance Ohms
4357	106 × 60	A35 (XVIII)	90—100	100—110	83	20	45	10	100
4376	115 × 60	Edison (XX)	90—100	100—110	83	20	45	10	100
4377	115 × 60	Edison (XX)	105—115	130—140	104	20	45	—	80
4687	94 × 29	P26 (XVI)	90	105	85	20	40	5	180
7475	60 × 28	A25,5 (XIX)	90—110	100—135	85—110	4	8	1	300
13201	144 × 53	Ed or A40 (XX)„(XIX)	90—110	100—135	85—110	100	200	5	80

PHILIPS PHOTO-ELECTRIC CELLS

Type Number	Valve type	Maximum dimensions without pins mm	Base (in brackets base connections, see p. 12)	Anode cathode capacity Cak μμF	Norm. anode voltage Va Volts	Sensitivity μA/Lm [1])	Striking voltage Volts	Max. anode voltage Va_{max} Volts	Max. anode current Ia_{max} μA	Min. protective resistance MΩ
3510	High vacuum cell with potassium cathode	165 × 60	H (XXII)	3	100	3	—	500	3	—
3512	High vacuum cell with potassium cathode	118 × 55	A (XXI)	3	100	20	—	500	5	—
3530	High vacuum cell with caesium cathode	60 × 16	(XXIII)	5	100	150	≧ 140	100	3	0,1
3533	High vacuum cell with caesium cathode	60 × 25	(XXIV)	5	100	150	≧ 140	100	3	0,1
3534	High vacuum cell with caesium cathode	85 × 25	(XXV)	5	100	150	≧ 140	100	3	0,1

[1]) Measured with a tungsten filament lamp. The temperature of the tungsten filament is 2600° K and the light current measured statically is 0·05 lumen.

PHILIPS GASFILLED TRIODES FOR TIME BASE UNITS

Type Number	Gasfilled	Maximum dimensions mm	Base (in brackets base connection, see p. 12)	Indirect heating		Capacity between			Arc-voltage (Extinction voltage) Volts	Max. peak value of voltage between 2 electrodes Volts	Max. peak value of anode voltage Volts	Max. peak value of anode current mA	Maximum value of mean anode current in oscillating condition mA [1])	Minimum resistance in grid circuit per volt peak voltage at grid Ω	Maximum resistance in grid circuit Rg_{max} MΩ	Maximum voltage between filament & cathode Volts [2])	Ratio between striking voltage and grid voltage	Maximum attainable frequency c/sec	Type Number
				Voltage Volts	Current Amps.	Grid & anode Cag μμF	Anode & cathode Cak μμF	Grid & cathode Cgk μμF											
4686	Argon	100 × 37	P30 (IX)	4,0	1,2	2,2	3,2	3,8	about 17	350	300	300	3	1000	0,5	100	21	50.000	**4686**
4690	Helium	100 × 43	P30 (X)	4,0	1,3	3,7	2,0	3,7	about 50	600	500	750	10	1000	0,5	100	40	150.000	**4690**

[1]) In a time-base circuit.

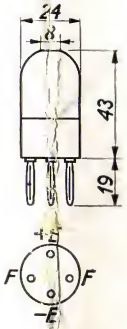
[2]) Cathode always positive with respect to the filament.

PHILIPS AMPLIFIER VALVES FOR SPECIAL PURPOSES

Type Number	Valve type and application	Maximum dimensions without pins mm	Base (Connection reference in brackets see p. 12)	Filament data			Max. anode voltage Va_{max} Volts	Anode current Ia mA	Neg. grid bias Vg_1 Volts	Screen-grid voltage Vg_2 Volts	Voltage on 3rd grid Vg_3 Volts	Screen-grid current Ig_2 mA	Conduct. at operating point S mA/V	Amplification factor μ	Internal resistance Ri Ohms	Grid current of 1st grid Ig_1 μA	Capacity between			Type Number
				Heating	Voltage Volts	Current Amps.											Anode and 1st grid Cag_1 μμF	Anode and cathode Cak μμF	1st grid and cathode Cgk μμF	
C408	Triode for valve voltmeter and other measuring instruments	150 × 58	A 35 (XI)	dir.	4,0	0,25	150	14	—7	—	—	—	2,7	8	3000	—	—	—	—	**C408**
4060	Electrometer triode	152 × 59	H 35 (XII)	dir.	about 0,5—0,7	1,0	4	—	—2,5	—	—	—	0,028	0,5	—	$<10^{-14}$	—	—	—	**4060**
4671	Triode for ultra short wave sets	35 × 26	without base (XIII)	indir.	6,3	0,15	200	4,5	—6	—	—	—	2,0	25	12500	—	1,4	0,6	1,0	**4671**
4672	Pentode for ultra short wave sets	48 × 26	without base (XIV)	indir.	6,3	0,15	250	2,0	—3	100	0	0,7	1,4	5000	$3,5.10^6$	—	<0,007	3,0	2,7	**4672**
4695	Variable-Mu Pentode for ultra short wave sets	48 × 26	without base (XIV)	indir.	6.3	0,15	250	5,5	—3 —45	100	0	1,8	1,8	1440	$0.8.10^6$ $>10^7$	—	<0,007	3.5	2,7	**4695**
4673	Pentode for television receivers	118 × 47	P 30 (VIII)	indir.	4,0	0 15	250	8,0	—2,5	200	0	1,5	5,0	—	$>1,5.10^6$	—	<0,012	7,5	9,6	**4673**

PHILIPS THERMO COUPLES

Type number	Current range (mA)	Resistance of the thermo couple (ohms)	Resistance of the filament	E.M.F. at max. current of the range (mV)
TH 005	0—5	13	80	5
TH 010	0—10	5	28	3,6
TH 020	0—20	5	10	3.6
TH 050	0—50	5	3	3,6
TH 100	0—100	5	1,2	3,6



The Philips Thermo Couples are so designed that in conjunction with a measuring instrument for 0—2·4 mV with an internal resistance of 10 Ω they give maximum deflection at the indicated maximum current. When using the Philips Thermo Couples with a measuring instrument giving purely quadratic reading the deviation is maximum 1·5 %. The tolerance of the indicated maximum value of the current is — 20 %. The full deflection of the measuring instrument is attained after 8—10 seconds. An overload of up to 100 % has no detrimental effect.

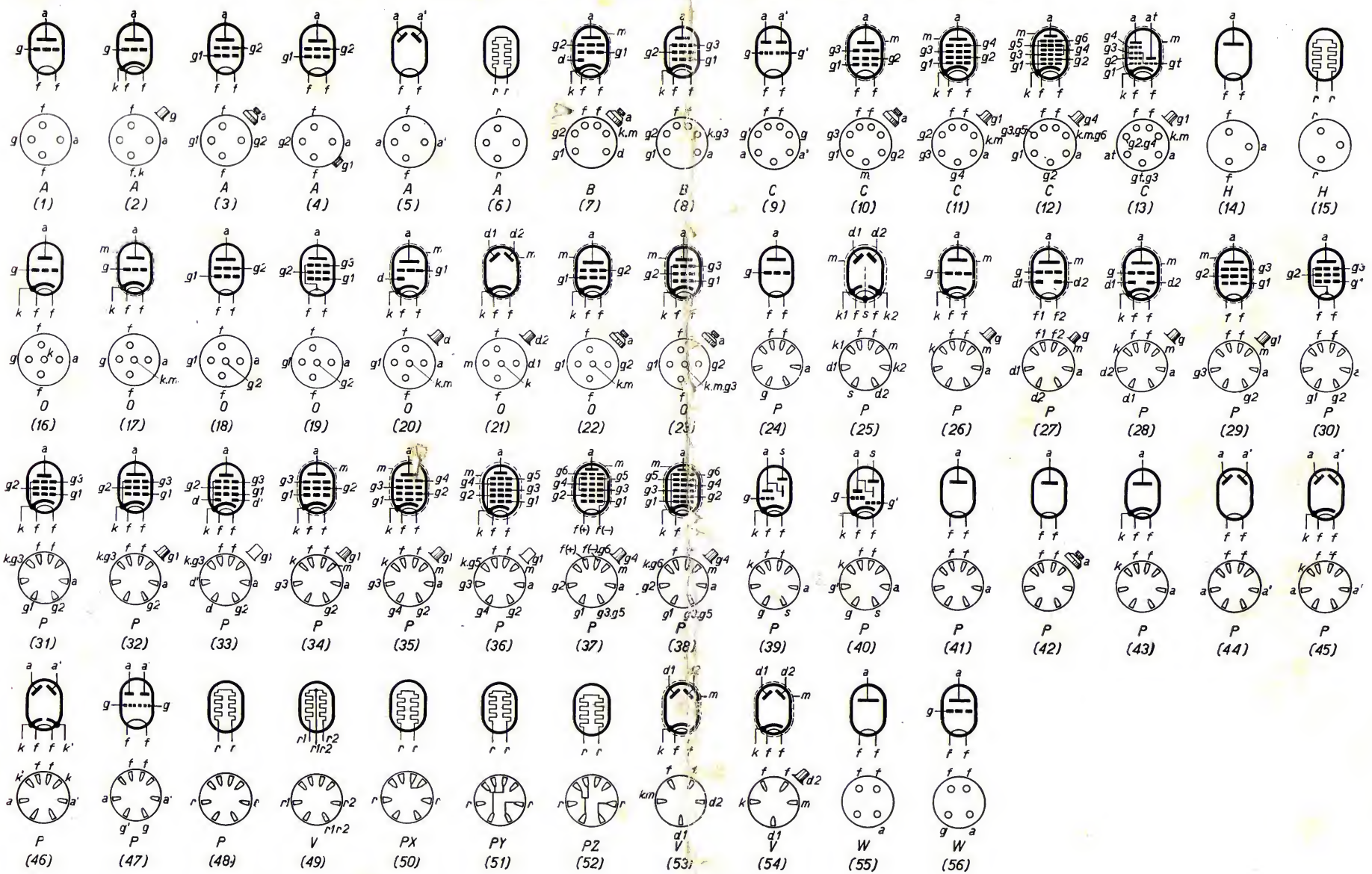
F = filament connections + E = thermo couple (positive pole) — E = thermo couple (negative pole)

SURVEY OF PHILIPS VALVES

Type	Page		Type	Page		Type	Page		Type	Page		Type	Page		Type	Page	
A 409	9		B 438	9		CBL 1	5		E 446	6		KF 3	8		1949	11	
A 415	9		B 442	9		CC 2	5		E 447	6		KF 4	8		3510	13	
A 425	9		B 443	7, 9		C/EM 2	3, 5		E 448	6		KK 2	8		3512	13	
A 441N	9		B 443S	7		CF 1	5		E 449	6		KL 4	8		3530	13	
A 442	9		B 2006	7		CF 2	5		E 451	10		MW 31-2	12		3533	13	
AB 1	6		B 2038	7		CF 3	5		E 452T	6		MW 39-2	12		3534	13	
AB 2	4		B 2043	7		CF 7	5		E 453	7		TH 005	14		4060	13	
ABC 1	4		B 2044	7		CH 1	5		E 455	6		TH 010	14		4357	13	
ABL 1	4		B 2044S	7		CK 1	5		E 463	7		TH 020	14		4376	13	
AC 2	4		B 2045	7		CL 1	5		E 499	6		TH 050	14		4377	13	
ACH 1	6		B 2046	7		CL 2	5		E 707	10		TH 100	14		4641	10	
AD 1	4		B 2047	7		CL 4	5		EB 4	3		506	11		4646	11	
AF 2	6		B 2048	7		CY 1	11		EBC 3	3		1018	11		4662	8	
AF 3	4		B 2049	7		CY 2	11		EBL 1	3		1561	11		4671	13	
AF 7	4		B 2052T	7		DG 7-1	12		EF 5	3		1801	11		4672	13	
AH 1	4		B 2099	7		DG 9-3	12		EF 6	3		1802	11		4673	13	
AK 1	6		C 1	11		DG 16-1	12		EH 2	3		1803	11		4682	10	
AK 2	4		C 2	11		DG 16-2	12		EK 2	3		1805	11		4683	10	
AL 1	4		C 3	11		DG 25-1	12		EL 2	3		1815	11		4684	10	
AL 2	4		C 4	11		DW 31-1	12		EL 3	3		1817	11		4686	13	
AL 4	4		C 6	11		DW 39-1	12		EL 5	3		1831	11		4687	13	
AL 5	4		C 7	11		E 406N	10		EM 1	3, 5		1832	11		4688	10	
AM 1	4		C 8	11		E 408N	10		EZ 2	11		1875	11		4689	10	
AM 2	4		C 9	11		E 409	6		EZ 4	11		1876	11		4690	13	
AX 1	11		C 10	11		E 424N	6		F 410	10		1904	11		4694	10	
AZ 1	11		C 12	11		E 438	6		F 443N	10		1910	11		4695	13	
B 217	9		C 243N	9		E 442	6		FZ 1	11		1911	11		7475	13	
B 228	9		C 408	13		E 442S	6		KB 2	8		1915	11		13201	13	
B 240	9		C 443	7		E 443H	7		KBC 1	8		1920	11				
B 405	9		C 443N	7		E 443N	10		KC 3	8		1926	11				
B 406	9		CB 1	5		E 444	6		KDD 1	8		1927	11				
B 409	7, 9		CB 2	5		E 444S	6		KF 1	9		1928	11				
B 424	9		CBC 1	5		E 445	6		KF 2	9		1941	11				

For other valves, such as transmitter valves, large amplifier valves, rectifier valves, valves for industrial purposes, etc. special catalogues are available on demand.

BASE CONNECTIONS OF PHILIPS "MINIWATT" VALVES



In the column "Bases" the first letter refers to the type of base, and the numeral to the base diameter in mm, whilst the number in brackets refers to the base connections as shown on this page. The base connections are those as seen from the underside of the base. The connection on the top of the bulb also is shown diagrammatically.